HAPTIC DISPLAY FOR A HANDHELD ELECTRONIC DEVICE

FIELD

[0002] The present disclosure, in a broad sense, is directed toward handheld electronic devices. In particular, the disclosure is based on (but not limited to) handheld communication devices that have wireless communication capabilities and the networks within which the wireless communication devices operate. (Other exemplary devices to which the disclosure may be applied include PDA's (with or without communication capabilities), remote controls, game consoles, GPS units, portable media players, and others in which user input is based on touch-screen inputs as opposed to switch-based inputs.) More particularly, the disclosure presents solutions regarding displays capable of facilitating user input on such devices.

BACKGROUND

[0003] With the proliferation of wireless communications systems, compatible handheld communication devices are becoming more prevalent, as well as advanced. Where in the past such handheld communication devices were typically limited to either voice transmission (cell phones) or text transmission (pagers and PDAs), today's consumer often demands a combination device capable of performing both types of transmissions, including even sending and receiving e-mail. Furthermore, these higher-performance devices can also be capable of sending and receiving other types of data including that which allows the viewing and use of Internet websites. These higher level functionalities necessarily require greater user interaction with the devices through included user interfaces (UIs) which may have originally been designed to accommodate making and receiving telephone calls and sending messages over a related Short Messaging Service (SMS). As might be expected, suppliers of such mobile communication devices and the related service providers are anxious to meet these customer requirements, but the demands of these more advanced functionalities have in many circumstances rendered the traditional user interfaces unsatisfactory—a situation that has caused designers to have to improve the UIs through which users input information and control these sophisticated operations.

[0004] Additionally, the size of the display screen available on such devices has seen increasing attention. In order to maximize the size of the display screen on a device, it may be necessary to limit input devices located on the front surface of the device. Typically, this can involve reducing the size of a keyboard on the front surface or assembling the device in a clam-shell, slidable, or other multi-part configuration. Alternatively, a touch screen can be implemented such that the user of the device inputs information into the device using a stylus, the user's fingertip, or other object. The stylus interface or other touch screen input devices prevent the user from experiencing tactile feedback from activation of a portion of the display screen. This can lead the user to make mistakes in inputting data and/or to become frustrated while trying to input the desired information.

[0005] The present disclosure provides solutions to these and other problems through the use of display that provides tactile (haptic) feedback to a user to indicate that a screen-inputted selection has been made.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Exemplary methods and arrangements conducted and configured according to the advantageous solutions presented herein are depicted in the accompanying drawings, wherein:

[0007] FIG. **1** depicts a handheld communication device with a haptic, touch-sensitive (HTS) display cradled in the palm of a user's hand;

[0008] FIG. **2**A depicts a handheld communication device with an HTS display showing both an alphabetic key arrangement and a navigational key arrangement;

[0009] FIG. **2**B depicts a handheld communication device with a phone key arrangement and a navigational key arrangement on an HTS display;

[0010] FIG. **3**A is a schematic section view illustrating the layers of an HTS display according to the disclosure;

[0011] FIG. **3**B is a schematic plan view of the top layer illustrated in FIG. **3**B;

[0012] FIG. **4** illustrates an exemplary QWERTY keyboard layout;

[0013] FIG. **5** illustrates an exemplary QWERTZ keyboard layout;

[0014] FIG. **6** illustrates an exemplary AZERTY keyboard layout;

[0015] FIG. **7** illustrates an exemplary Dvorak keyboard layout;

[0016] FIG. **8** illustrates a QWERTY keyboard layout paired with a traditional ten-key keyboard; and

[0017] FIG. **9** is a block diagram representing a wireless handheld communication device interacting in a communication network.

DETAILED DESCRIPTION

[0018] As suggested hereinabove, one of the more important aspects of a handheld electronic device to which this disclosure is directed is its size. While some users will grasp the device in both hands, it is intended that a predominance of users will cradle the device in one hand in such a manner that input and control over the device can be effected using the thumb of the same hand in which the device is held, however additional control can be effected by using both hands. As a handheld device that is desirably pocketable, the size of the device must be kept relatively small. Of the device's dimensions, limiting its width is important for the purpose of assuring cradleability in a user's hand. Moreover, it is preferred that the width of the device be maintained at less than eight centimeters (approximately three inches). Keeping the device within these dimensional limits provides a hand cradleable unit that users prefer for its useability and portability. Limitations with respect to the height (length) of the device are less stringent when considering hand-cradleability. Therefore, in order to gain greater size, the device can be advantageously configured so that its height is greater than its width, but still remains easily supported and operated in one hand.